FIG.1

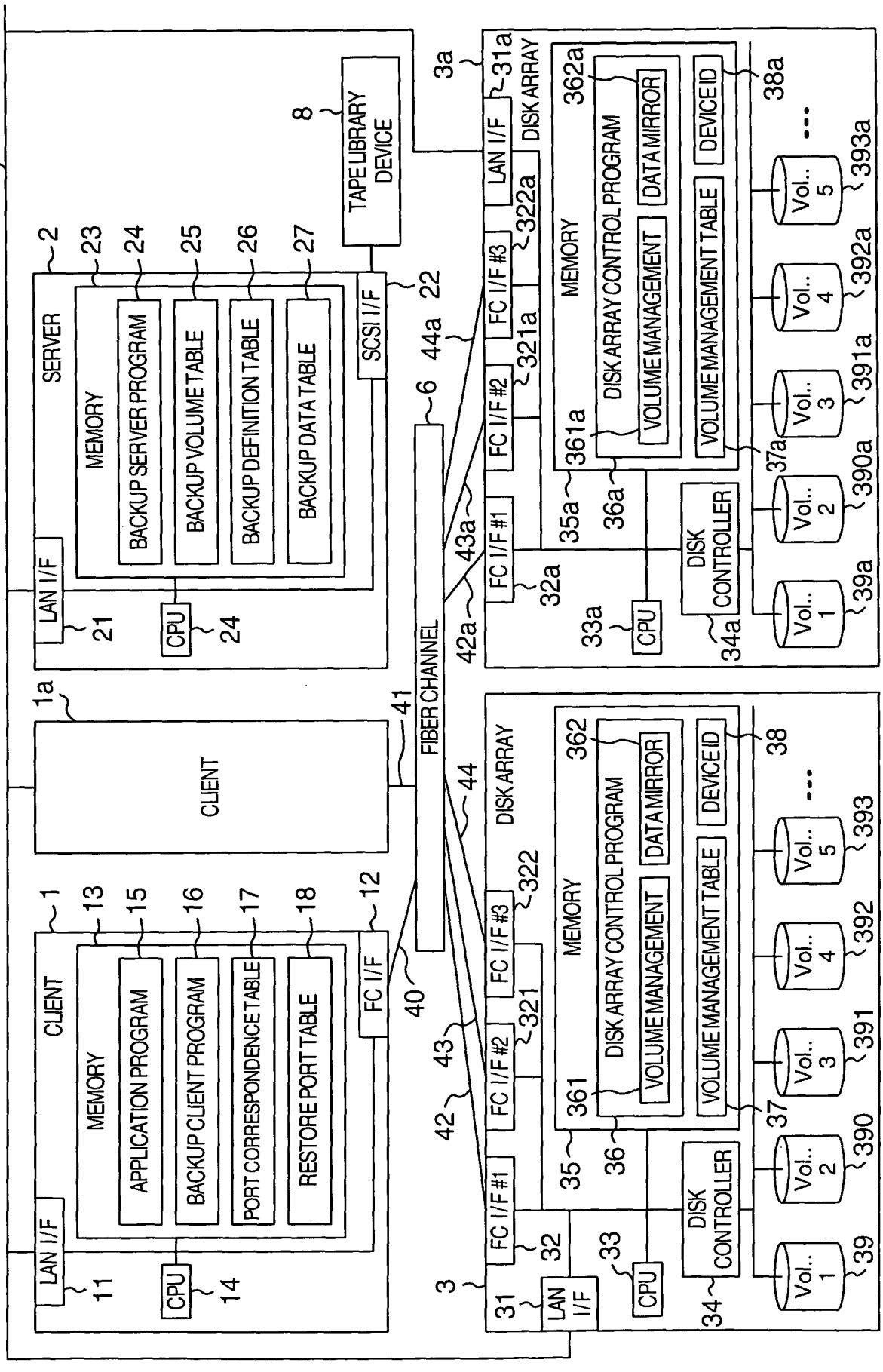

5
LAN
CLIENT
1
LAN I/F
11
CPU
14
MEMORY
13
APPLICATION PROGRAM
15
BACKUP CLIENT PROGRAM
16
PORT CORRESPONDENCE TABLE
17
RESTORE PORT TABLE
18
FC I/F
12
1a
CLIENT
SERVER
2
LAN I/F
21
CPU
24
MEMORY
23
BACKUP SERVER PROGRAM
24
BACKUP VOLUME TABLE
25
BACKUP DEFINITION TABLE
26
BACKUP DATA TABLE
27
SCSI I/F
22
TAPE LIBRARY DEVICE
8
FIBER CHANNEL
41
6
40
44
44a
3
DISK ARRAY
FC I/F #1
32
FC I/F #2
321
FC I/F #3
322
LAN I/F
31
CPU
33
DISK CONTROLLER
34
MEMORY
362
DISK ARRAY CONTROL PROGRAM
VOLUME MANAGEMENT
DATA MIRROR
VOLUME MANAGEMENT TABLE
DEVICE ID
361
35
36
37
38
Vol.. 1
Vol.. 2
Vol.. 3
Vol.. 4
Vol.. 5
39
390
391
392
393
42
43
3a
DISK ARRAY
FC I/F #1
32a
FC I/F #2
321a
FC I/F #3
322a
LAN I/F
31a
CPU
33a
DISK CONTROLLER
34a
MEMORY
362a
DISK ARRAY CONTROL PROGRAM
VOLUME MANAGEMENT
DATA MIRROR
VOLUME MANAGEMENT TABLE
DEVICE ID
361a
35a
36a
37a
38a
Vol.. 1
Vol.. 2
Vol.. 3
Vol.. 4
Vol.. 5
39a
390a
391a
392a
393a
42a
43a
44a

FIG.2A

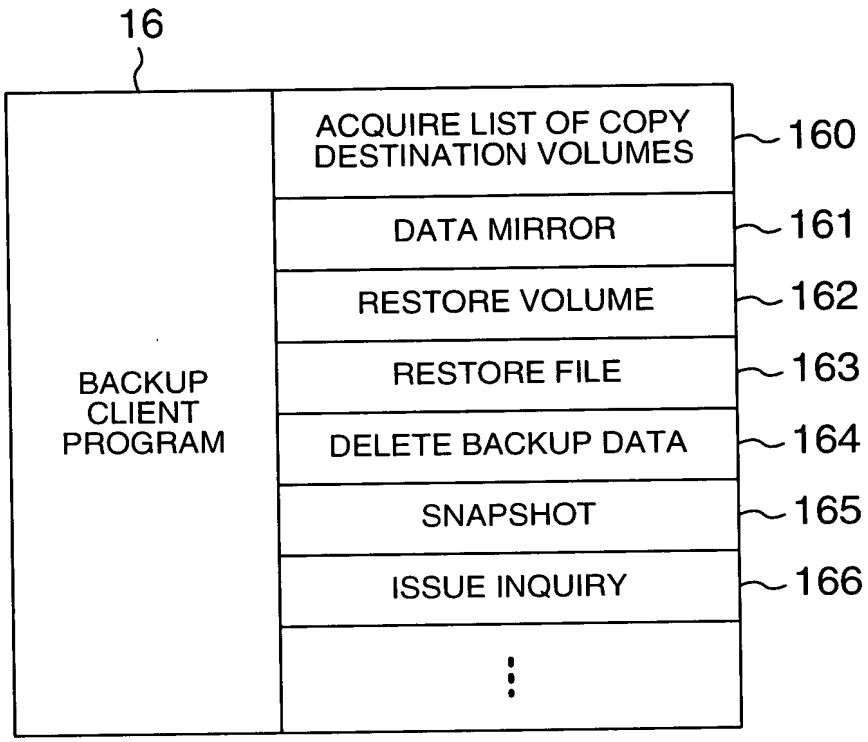

16
BACKUP CLIENT PROGRAM
ACQUIRE LIST OF COPY DESTINATION VOLUMES
160
DATA MIRROR
161
RESTORE VOLUME
162
RESTORE FILE
163
DELETE BACKUP DATA
164
SNAPSHOT
165
ISSUE INQUIRY
166

FIG.2B

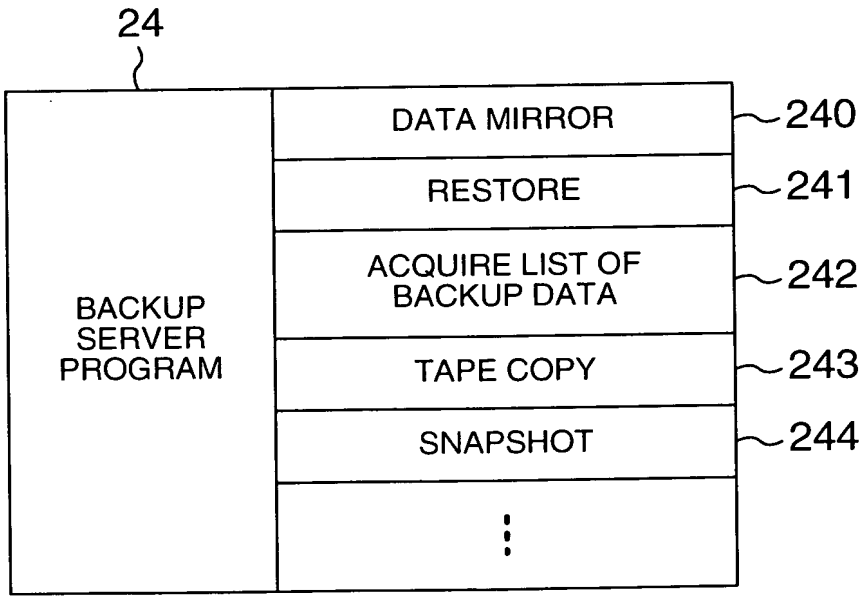

24
BACKUP SERVER PROGRAM
DATA MIRROR
240
RESTORE
241
ACQUIRE LIST OF BACKUP DATA
242
TAPE COPY
243
SNAPSHOT
244

FIG.3

17 PORT CORRESPONDENCE TABLE

171 MOUNT POINT	172 DEVICE FILE	173 FC Port Addr.	174 LUN
	⋮		

FIG.4

25 BACKUP VOLUME TABLE

251 HOST COMPUTER NAME	252 MOUNT POINT	253 DEVICE ID	254 Vol. NUMBER LIST
	⋮		

FIG.5

26 BACKUP DEFINITION TABLE

261 HOST COMPUTER NAME	262 MOUNT POINT	263 BACKUP CLASSIFICATION	264 BACKUP DESTINATION	265 PREPROCESS	266 POSTPROCESS	267 LABEL	268 SCHEDULE
	⋮						

FIG.6

27 BACKUP DATA TABLE

271 HOST COMPUTER NAME	272 MOUNT POINT	273 BACKUP CLASSIFICATION	274 DEVICE ID	275 MEDIA ID	276 LABEL	277 TIME STAMP
	⋮					

FIG.7

37 VOLUME MANAGEMENT TABLE

371 Vol. NUMBER	372 FC I/F NUMBER	373 FC Port Addr.	374 LUN	375 LIST OF COPY DESTINATION Vol. NUMBER	376 VOLUME INFORMATION
	⋮				

FIG.8

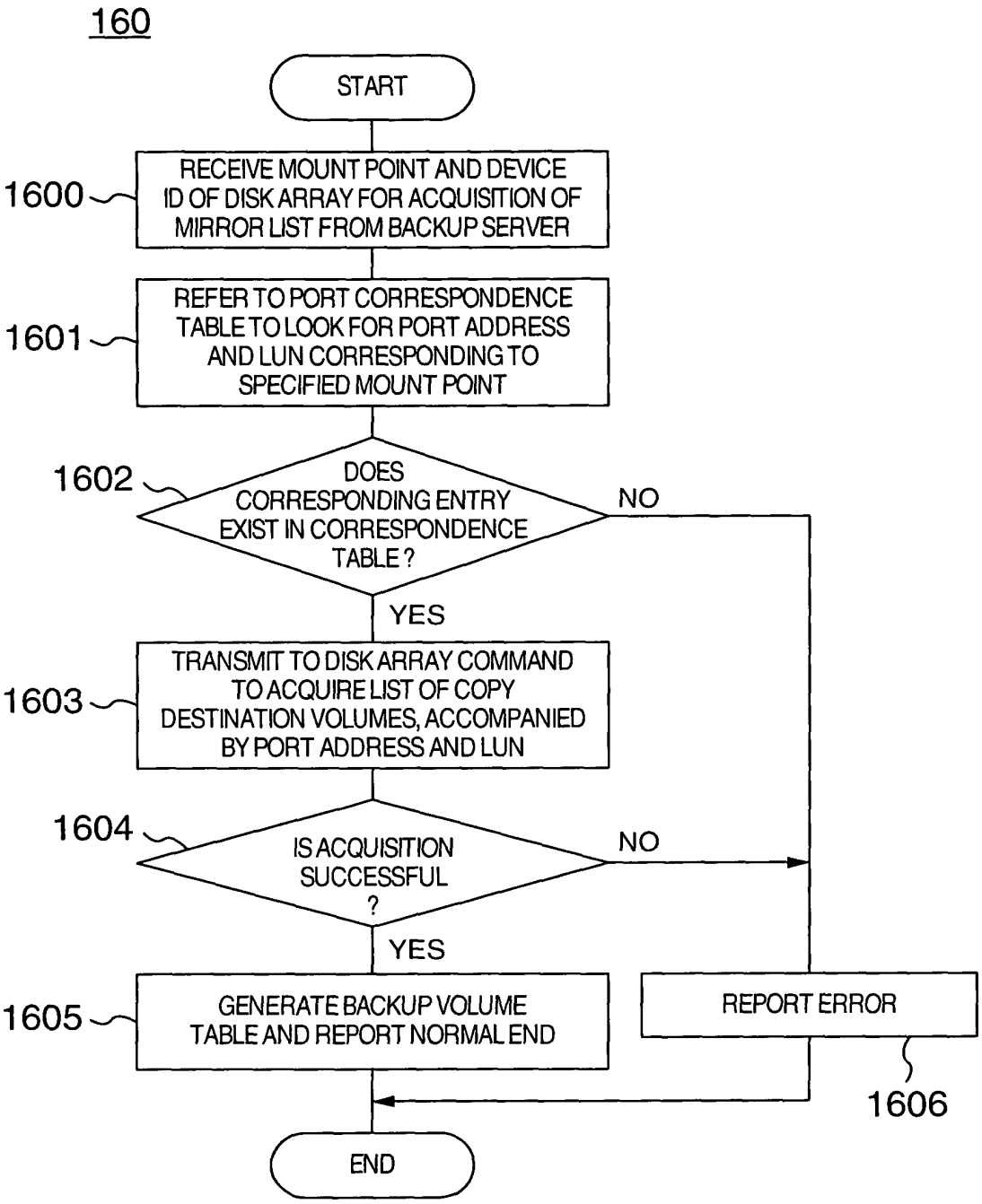

160
START
1600
RECEIVE MOUNT POINT AND DEVICE ID OF DISK ARRAY FOR ACQUISITION OF MIRROR LIST FROM BACKUP SERVER
1601
REFER TO PORT CORRESPONDENCE TABLE TO LOOK FOR PORT ADDRESS AND LUN CORRESPONDING TO SPECIFIED MOUNT POINT
1602
DOES CORRESPONDING ENTRY EXIST IN CORRESPONDENCE TABLE ?
NO
YES
1603
TRANSMIT TO DISK ARRAY COMMAND TO ACQUIRE LIST OF COPY DESTINATION VOLUMES, ACCOMPANIED BY PORT ADDRESS AND LUN
1604
IS ACQUISITION SUCCESSFUL ?
NO
YES
1605
GENERATE BACKUP VOLUME TABLE AND REPORT NORMAL END
REPORT ERROR
1606
END

FIG.9

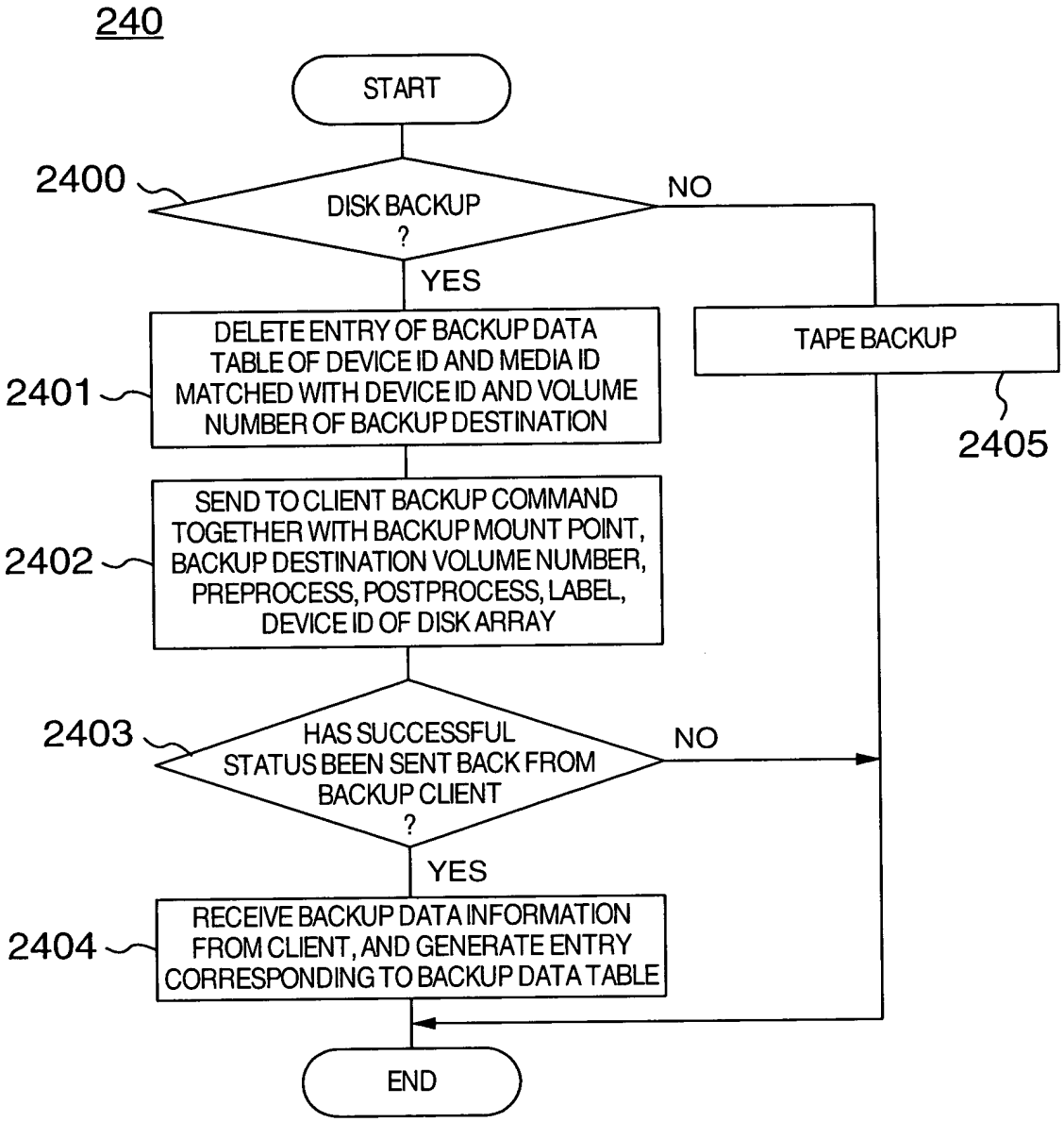

240
START
2400
DISK BACKUP ?
NO
YES
TAPE BACKUP
2405
2401
DELETE ENTRY OF BACKUP DATA TABLE OF DEVICE ID AND MEDIA ID MATCHED WITH DEVICE ID AND VOLUME NUMBER OF BACKUP DESTINATION
2402
SEND TO CLIENT BACKUP COMMAND TOGETHER WITH BACKUP MOUNT POINT, BACKUP DESTINATION VOLUME NUMBER, PREPROCESS, POSTPROCESS, LABEL, DEVICE ID OF DISK ARRAY
2403
HAS SUCCESSFUL STATUS BEEN SENT BACK FROM BACKUP CLIENT ?
NO
YES
2404
RECEIVE BACKUP DATA INFORMATION FROM CLIENT, AND GENERATE ENTRY CORRESPONDING TO BACKUP DATA TABLE
END

FIG.10

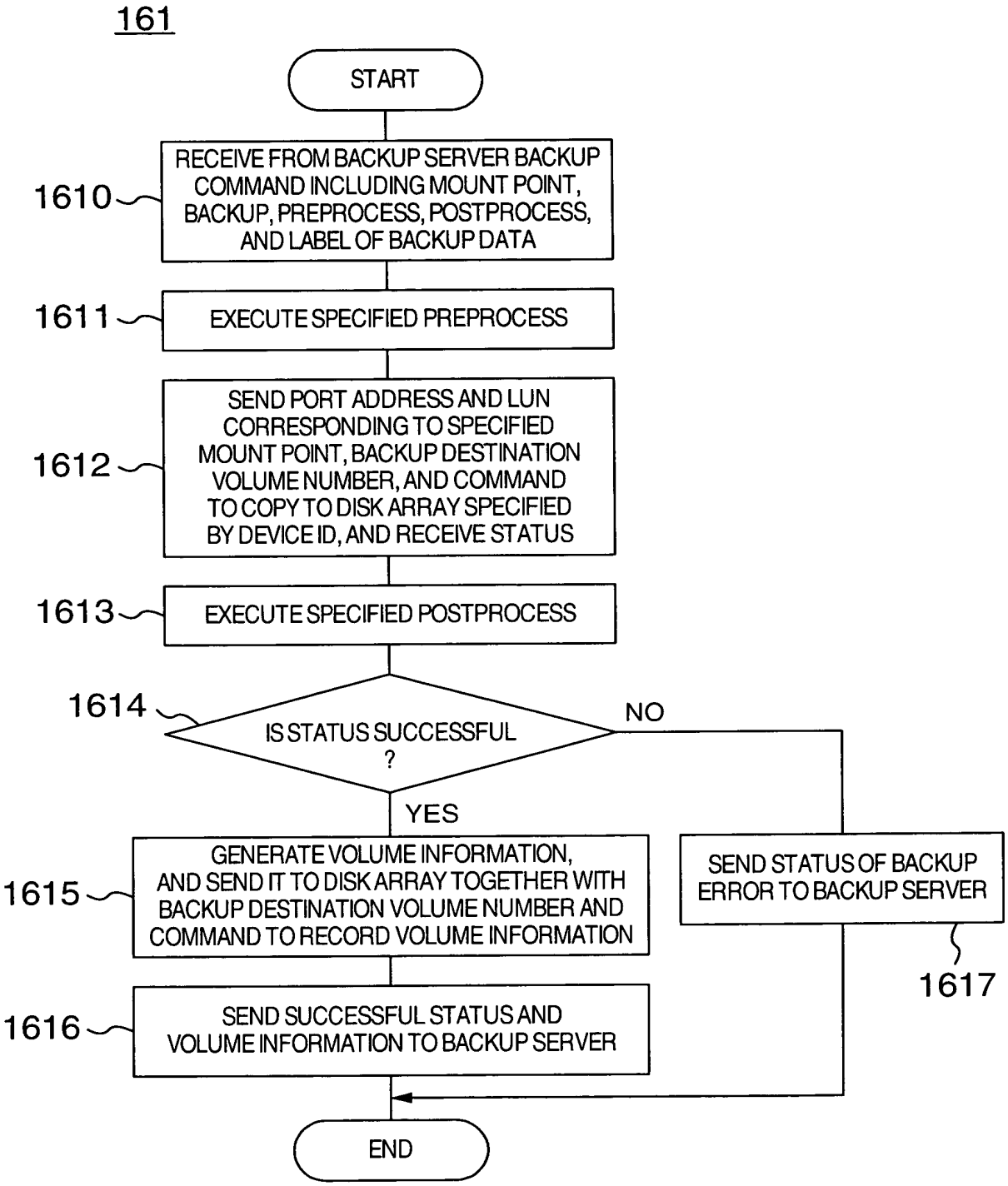

161
START
RECEIVE FROM BACKUP SERVER BACKUP COMMAND INCLUDING MOUNT POINT, BACKUP, PREPROCESS, POSTPROCESS, AND LABEL OF BACKUP DATA
1610
EXECUTE SPECIFIED PREPROCESS
1611
SEND PORT ADDRESS AND LUN CORRESPONDING TO SPECIFIED MOUNT POINT, BACKUP DESTINATION VOLUME NUMBER, AND COMMAND TO COPY TO DISK ARRAY SPECIFIED BY DEVICE ID, AND RECEIVE STATUS
1612
EXECUTE SPECIFIED POSTPROCESS
1613
IS STATUS SUCCESSFUL ?
1614
NO
YES
GENERATE VOLUME INFORMATION, AND SEND IT TO DISK ARRAY TOGETHER WITH BACKUP DESTINATION VOLUME NUMBER AND COMMAND TO RECORD VOLUME INFORMATION
1615
SEND STATUS OF BACKUP ERROR TO BACKUP SERVER
1617
SEND SUCCESSFUL STATUS AND VOLUME INFORMATION TO BACKUP SERVER
1616
END

FIG.11

50 VOLUME INFORMATION

BYTE OFFSET	INFORMATION	
0	FORMAT ID	501
4	LABEL	502
132	HOST	503
164	MOUNT POINT	504
420	TIME STAMP	505
424	(reserved)	506

FIG.12

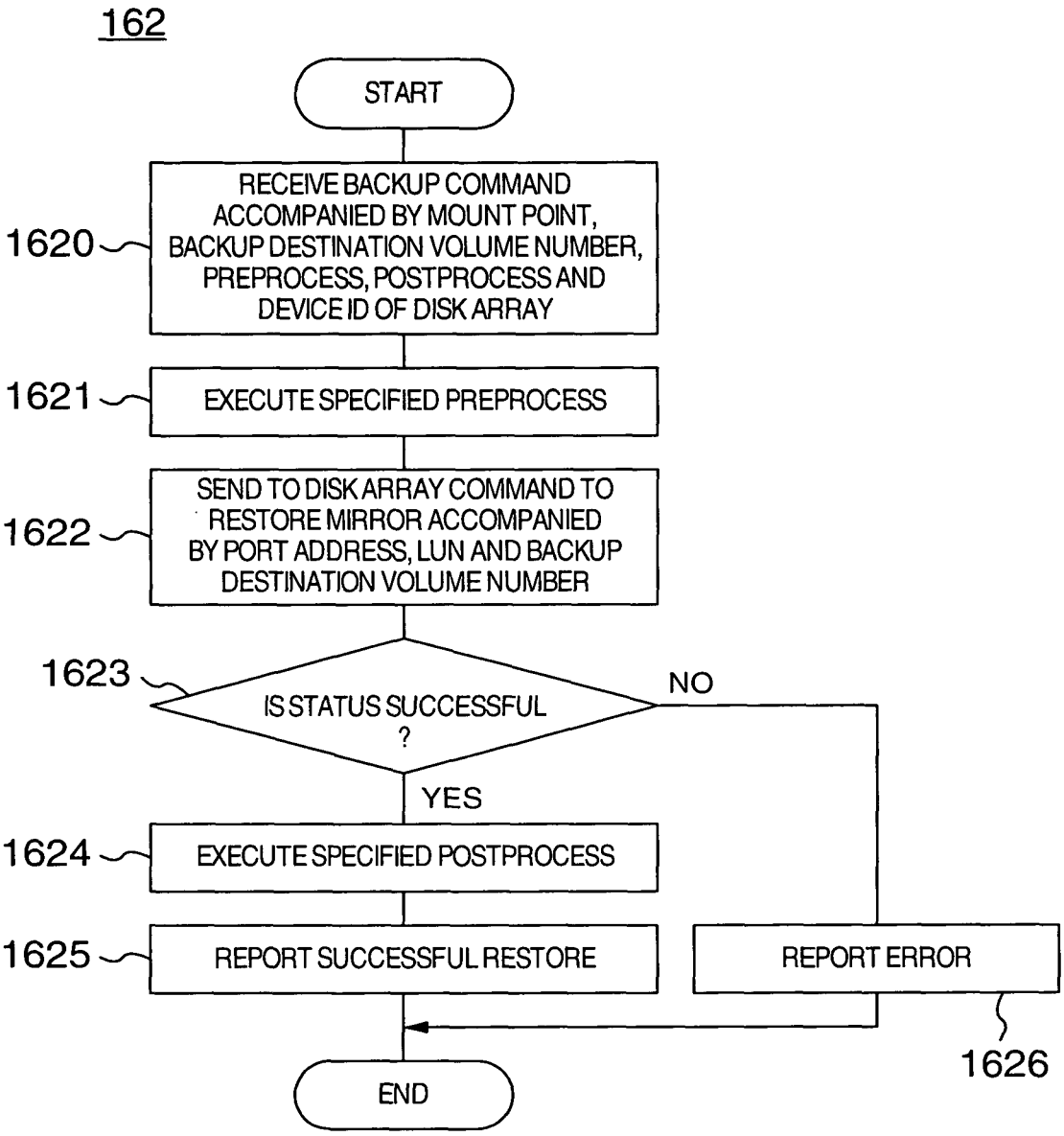

162
START
RECEIVE BACKUP COMMAND ACCOMPANIED BY MOUNT POINT, BACKUP DESTINATION VOLUME NUMBER, PREPROCESS, POSTPROCESS AND DEVICE ID OF DISK ARRAY
1620
EXECUTE SPECIFIED PREPROCESS
1621
SEND TO DISK ARRAY COMMAND TO RESTORE MIRROR ACCOMPANIED BY PORT ADDRESS, LUN AND BACKUP DESTINATION VOLUME NUMBER
1622
IS STATUS SUCCESSFUL ?
1623
NO
YES
EXECUTE SPECIFIED POSTPROCESS
1624
REPORT SUCCESSFUL RESTORE
1625
REPORT ERROR
1626
END

FIG.13

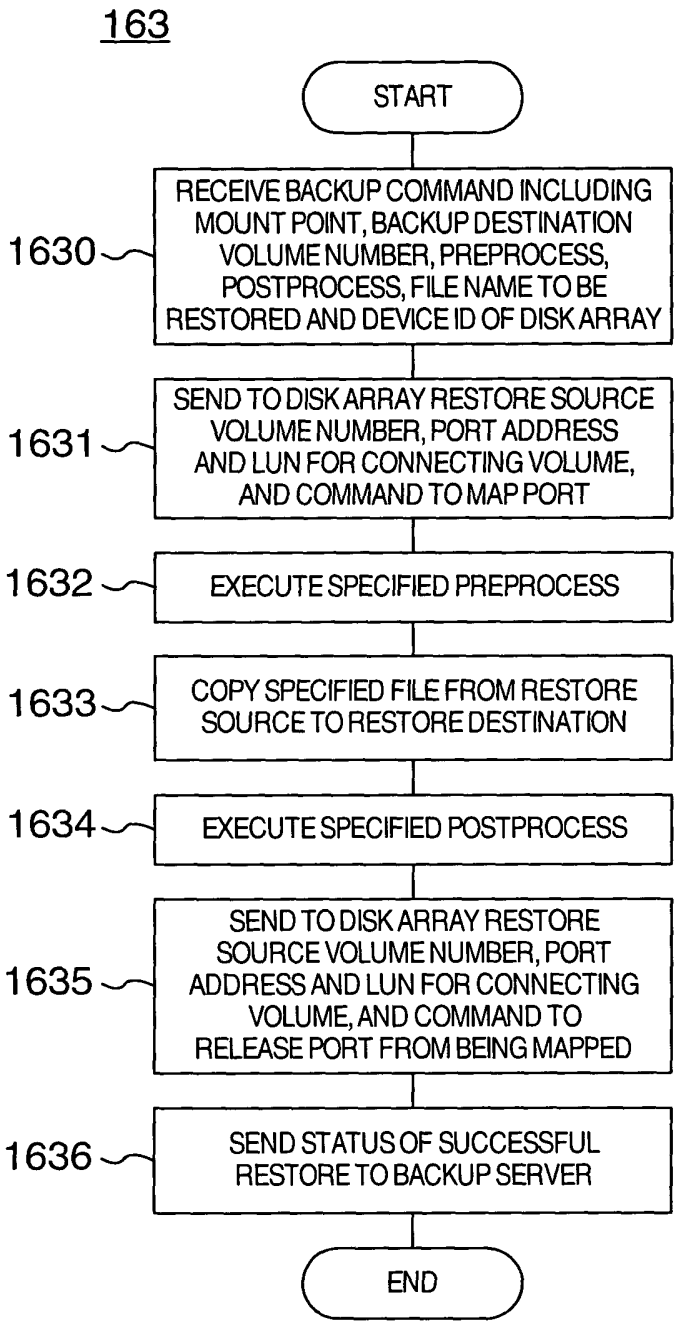

163
START
1630
RECEIVE BACKUP COMMAND INCLUDING MOUNT POINT, BACKUP DESTINATION VOLUME NUMBER, PREPROCESS, POSTPROCESS, FILE NAME TO BE RESTORED AND DEVICE ID OF DISK ARRAY
1631
SEND TO DISK ARRAY RESTORE SOURCE VOLUME NUMBER, PORT ADDRESS AND LUN FOR CONNECTING VOLUME, AND COMMAND TO MAP PORT
1632
EXECUTE SPECIFIED PREPROCESS
1633
COPY SPECIFIED FILE FROM RESTORE SOURCE TO RESTORE DESTINATION
1634
EXECUTE SPECIFIED POSTPROCESS
1635
SEND TO DISK ARRAY RESTORE SOURCE VOLUME NUMBER, PORT ADDRESS AND LUN FOR CONNECTING VOLUME, AND COMMAND TO RELEASE PORT FROM BEING MAPPED
1636
SEND STATUS OF SUCCESSFUL RESTORE TO BACKUP SERVER
END

FIG.14

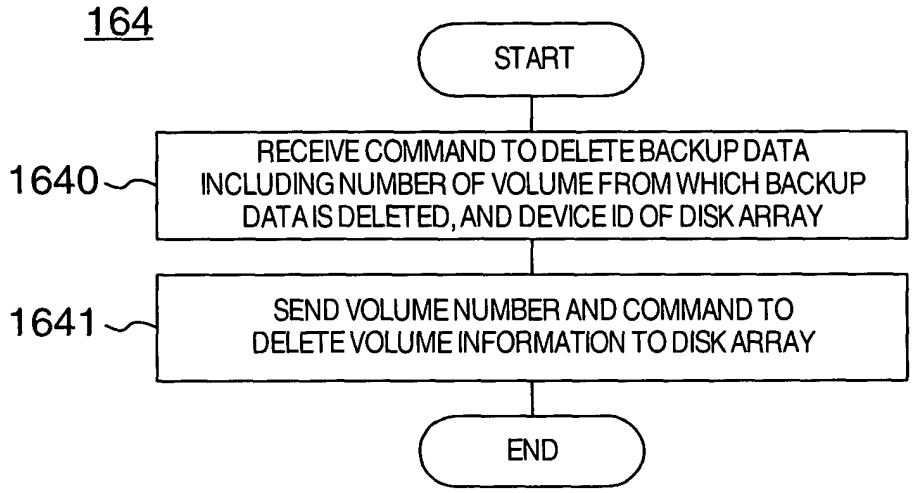

164
START
1640
RECEIVE COMMAND TO DELETE BACKUP DATA INCLUDING NUMBER OF VOLUME FROM WHICH BACKUP DATA IS DELETED, AND DEVICE ID OF DISK ARRAY
1641
SEND VOLUME NUMBER AND COMMAND TO DELETE VOLUME INFORMATION TO DISK ARRAY
END

FIG.15

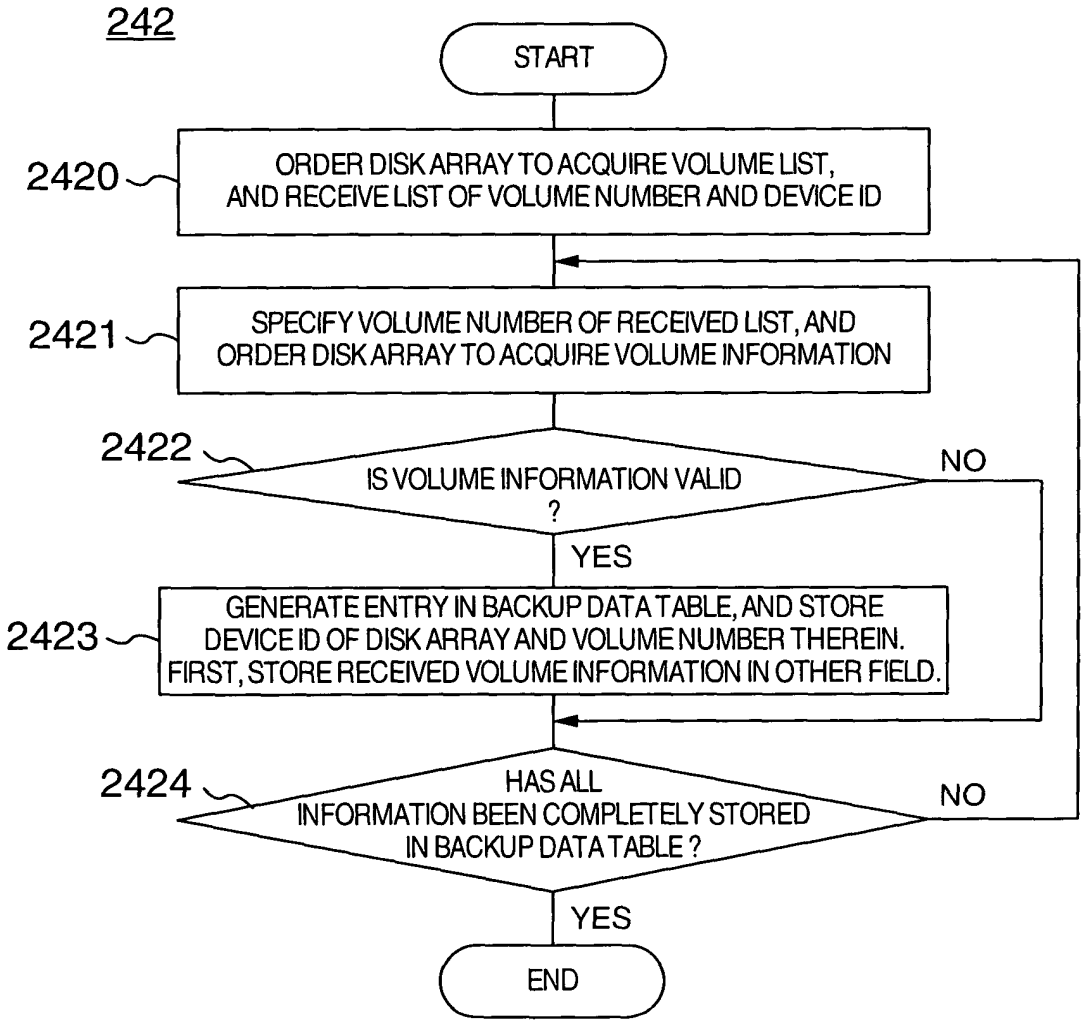

242
START
2420
ORDER DISK ARRAY TO ACQUIRE VOLUME LIST, AND RECEIVE LIST OF VOLUME NUMBER AND DEVICE ID
2421
SPECIFY VOLUME NUMBER OF RECEIVED LIST, AND ORDER DISK ARRAY TO ACQUIRE VOLUME INFORMATION
2422
IS VOLUME INFORMATION VALID ?
NO
YES
2423
GENERATE ENTRY IN BACKUP DATA TABLE, AND STORE DEVICE ID OF DISK ARRAY AND VOLUME NUMBER THEREIN. FIRST, STORE RECEIVED VOLUME INFORMATION IN OTHER FIELD.
2424
HAS ALL INFORMATION BEEN COMPLETELY STORED IN BACKUP DATA TABLE ?
NO
YES
END

FIG.16

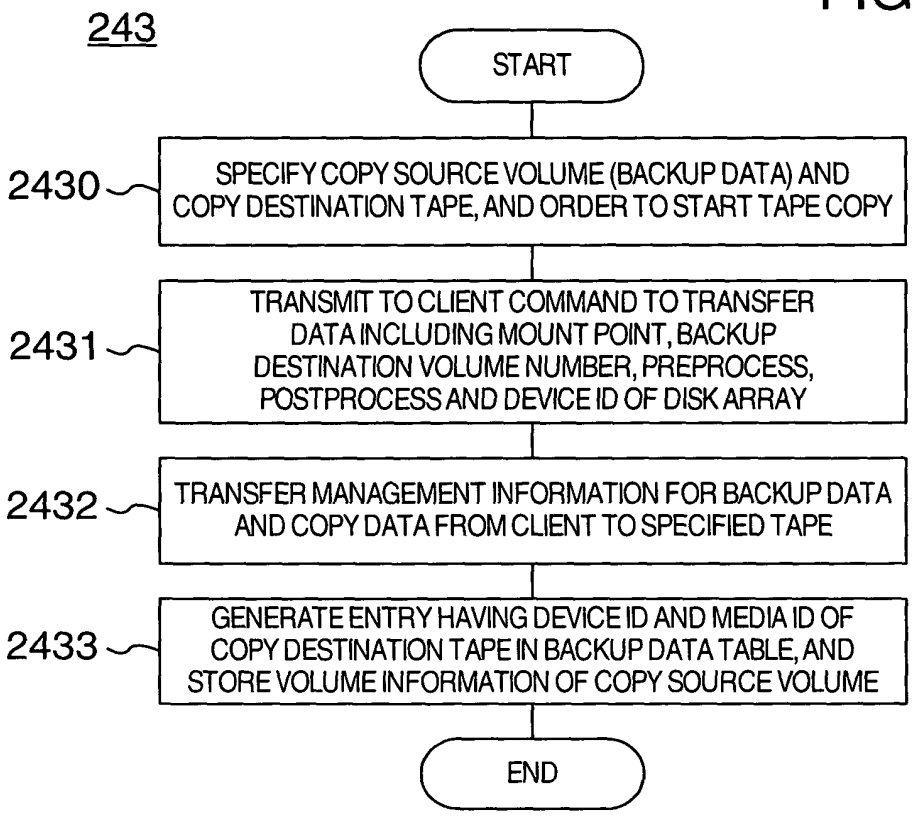

243
START
2430
SPECIFY COPY SOURCE VOLUME (BACKUP DATA) AND COPY DESTINATION TAPE, AND ORDER TO START TAPE COPY
2431
TRANSMIT TO CLIENT COMMAND TO TRANSFER DATA INCLUDING MOUNT POINT, BACKUP DESTINATION VOLUME NUMBER, PREPROCESS, POSTPROCESS AND DEVICE ID OF DISK ARRAY
2432
TRANSFER MANAGEMENT INFORMATION FOR BACKUP DATA AND COPY DATA FROM CLIENT TO SPECIFIED TAPE
2433
GENERATE ENTRY HAVING DEVICE ID AND MEDIA ID OF COPY DESTINATION TAPE IN BACKUP DATA TABLE, AND STORE VOLUME INFORMATION OF COPY SOURCE VOLUME
END

FIG.17

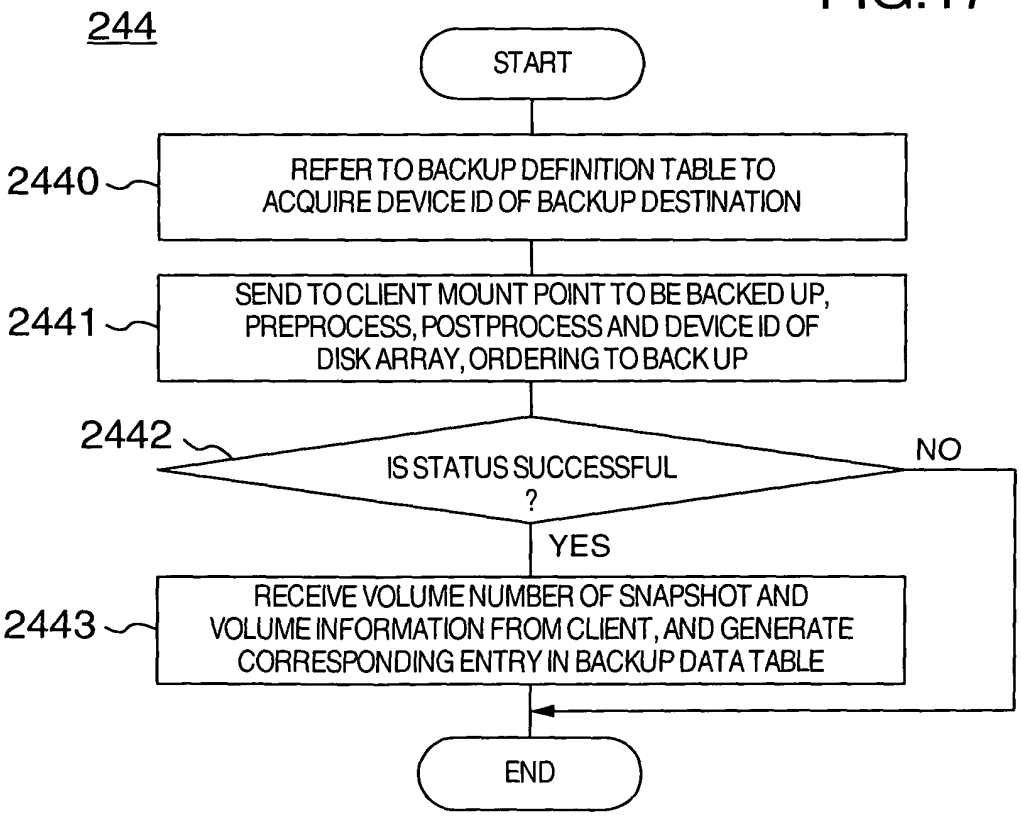

244
START
2440
REFER TO BACKUP DEFINITION TABLE TO ACQUIRE DEVICE ID OF BACKUP DESTINATION
2441
SEND TO CLIENT MOUNT POINT TO BE BACKED UP, PREPROCESS, POSTPROCESS AND DEVICE ID OF DISK ARRAY, ORDERING TO BACK UP
2442
IS STATUS SUCCESSFUL ?
NO
YES
2443
RECEIVE VOLUME NUMBER OF SNAPSHOT AND VOLUME INFORMATION FROM CLIENT, AND GENERATE CORRESPONDING ENTRY IN BACKUP DATA TABLE
END

FIG.18

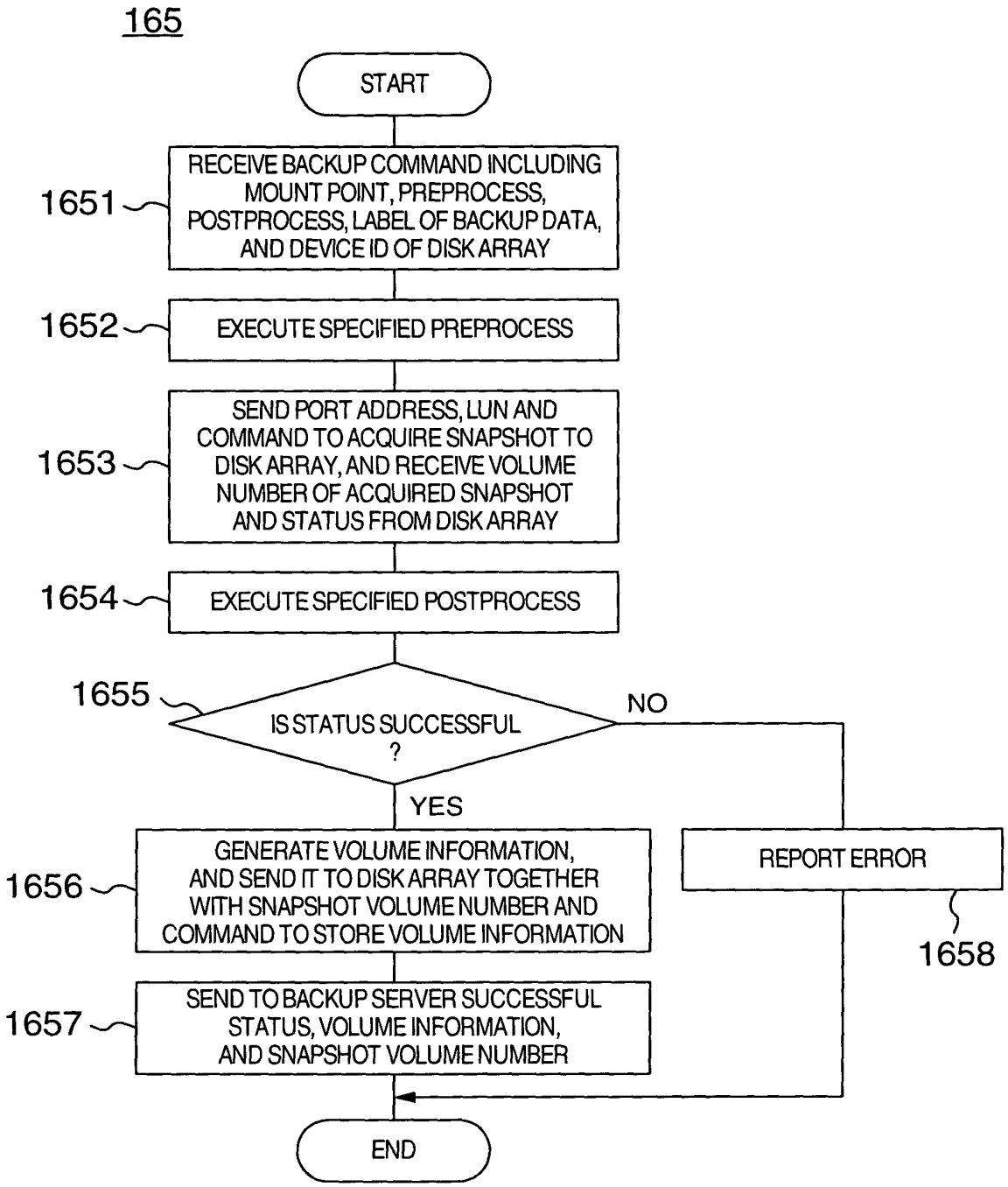
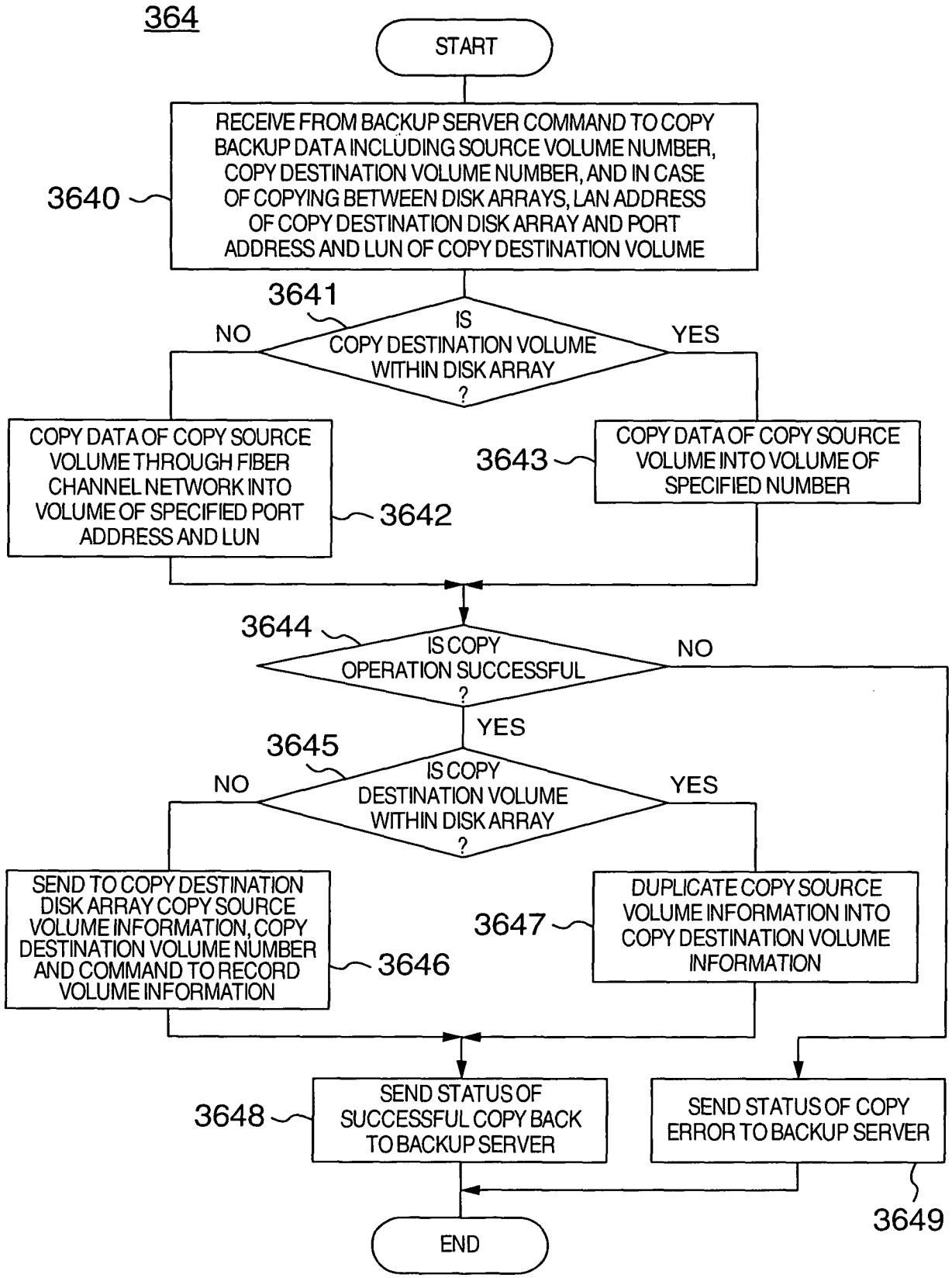

165
START
RECEIVE BACKUP COMMAND INCLUDING MOUNT POINT, PREPROCESS, POSTPROCESS, LABEL OF BACKUP DATA, AND DEVICE ID OF DISK ARRAY
1651
EXECUTE SPECIFIED PREPROCESS
1652
SEND PORT ADDRESS, LUN AND COMMAND TO ACQUIRE SNAPSHOT TO DISK ARRAY, AND RECEIVE VOLUME NUMBER OF ACQUIRED SNAPSHOT AND STATUS FROM DISK ARRAY
1653
EXECUTE SPECIFIED POSTPROCESS
1654
IS STATUS SUCCESSFUL ?
1655
NO
YES
GENERATE VOLUME INFORMATION, AND SEND IT TO DISK ARRAY TOGETHER WITH SNAPSHOT VOLUME NUMBER AND COMMAND TO STORE VOLUME INFORMATION
1656
REPORT ERROR
1658
SEND TO BACKUP SERVER SUCCESSFUL STATUS, VOLUME INFORMATION, AND SNAPSHOT VOLUME NUMBER
1657
END

FIG.19


364
START
RECEIVE FROM BACKUP SERVER COMMAND TO COPY BACKUP DATA INCLUDING SOURCE VOLUME NUMBER, COPY DESTINATION VOLUME NUMBER, AND IN CASE OF COPYING BETWEEN DISK ARRAYS, LAN ADDRESS OF COPY DESTINATION DISK ARRAY AND PORT ADDRESS AND LUN OF COPY DESTINATION VOLUME
3640
3641
IS COPY DESTINATION VOLUME WITHIN DISK ARRAY ?
NO
YES
COPY DATA OF COPY SOURCE VOLUME THROUGH FIBER CHANNEL NETWORK INTO VOLUME OF SPECIFIED PORT ADDRESS AND LUN
3642
3643
COPY DATA OF COPY SOURCE VOLUME INTO VOLUME OF SPECIFIED NUMBER
3644
IS COPY OPERATION SUCCESSFUL ?
NO
YES
3645
IS COPY DESTINATION VOLUME WITHIN DISK ARRAY ?
NO
YES
SEND TO COPY DESTINATION DISK ARRAY COPY SOURCE VOLUME INFORMATION, COPY DESTINATION VOLUME NUMBER AND COMMAND TO RECORD VOLUME INFORMATION
3646
3647
DUPLICATE COPY SOURCE VOLUME INFORMATION INTO COPY DESTINATION VOLUME INFORMATION
3648
SEND STATUS OF SUCCESSFUL COPY BACK TO BACKUP SERVER
SEND STATUS OF COPY ERROR TO BACKUP SERVER
3649
END